

November 18, 1970

Dear Howard,

Thanks for your letter of 11/12. I think the enclosed letter to Dick touches on most of your points.

Yes, I really do think that brain matter might (not "must") cause pieces of lead to come off a larger piece. Do you need to invoke little men to slow the fragments down? Were there little men with shovels getting bits of copper from the jacket onto the clothing as the unbroken bullet passed through?

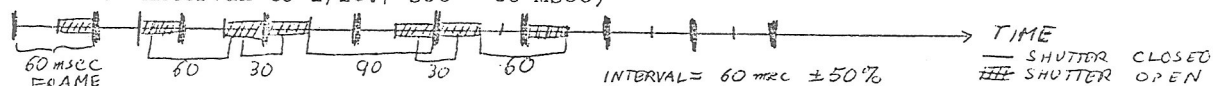
As I understand it, the figure of 2,500 fps is that required for the more or less complete bursting of a bullet. That's not at issue. The question is whether fine particles of lead can be rubbed off; that must be settled by an experiment. If you know of any expert who has done such an experiment, let me know.

Incidentally, I wasn't making that hypothesis up, you know. I got it from the autopsy doctors. Not a very good source, but I was not searching the corners of my mind for anything that might salvage a hypothesis (to which I am not as dedicated as some people would like to believe.)

Of course you are right in pointing out that some metal may have been in the brain tissue that was lost. As I pointed out in the Supplement, perhaps the exit at the top of the head was consistent with a front shot.

Recall that the question of the exact interval between Zapruder frames came up in the context of the accuracy of my estimate of the backward momentum in the film. That is, is Thompson's calculation significantly - 25% or more - off? I'm aware of the problems in his data, but I will stand by what I said earlier.

Harold's hasty attempt to revive the possibility of a 100% error in the interval is simply wrong. Repeating what I said in diagram form: (rounding off the "correct" interval to $1/16.7 \text{ sec} = 60 \text{ msec}$)



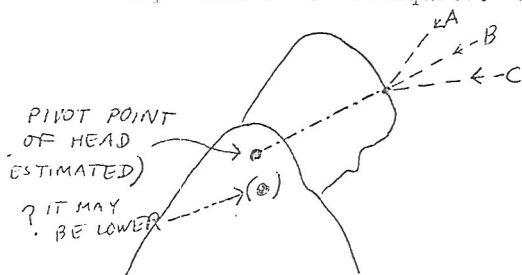
That is, with the shutter open half the time, the interval between the corresponding points in any two frames is off by at most 50%.

The fluctuations you describe can be caused by motion of the camera, can't they? And wouldn't such fluctuation in the exposure time (as opposed to the location of the exposure within the $1/18.3 \text{ sec}$ interval) show up also as variation in the brightness (exposure) of the film? This question still doesn't bother me. (I did not say that the accuracy of the simulation didn't bother me. On the contrary, quite a bit of the Supplement deals with that question.)

The bullet impact you depicted on page 3 of your letter would not cause a forward pivoting. It could if it came from a steeper forward angle. If the explanation I provided in my letter of 10/29 is not clear, perhaps you should ask a physics student at your college, since I can't tell exactly where my explanation is inadequate. Here is a diagram of my own: Bullet A will produce forward pivoting; B, no pivoting at all; C, backward pivoting. If the pivot point is higher than my estimate, you may be correct, although I am not sure that the backward motion would be delayed.

Sincerely,

Paul
Paul Hoch



cc: Bernabei, Weisberg